Configuring Data Compression Services

Router Software Version 11.0
Site Manager Software Version 5.0

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Bay Networks

Bay Networks

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About This Guide

If you are responsible for configuring and managing Bay Networks™ routers and/or BNX® switching platforms running over Frame Relay, Point-to-Point, or X.25 networks, read this guide to learn how to customize Bay Networks platforms for software- and hardware-based data compression.

Refer to this guide for

- Instructions for starting compression (Chapter 1)
- An overview of data compression services (Chapter 2)
- Descriptions of and instructions for editing compression line and interface parameters (Chapter 3)
- Default parameter settings (Appendix A)

Before You Begin

Before using this guide, you must complete the following procedures. For a new router:

- Install the router (refer to the installation manual that came with your router).
- Connect the router to the network and create a pilot configuration file (refer to *Quick-Starting Routers*, *Connecting AN and ANH Systems to a Network*, or *Connecting ASN Routers to a Network)*.

Make sure that you are running the latest version of Bay Networks Site Manager and router software. For instructions, refer to *Upgrading Routers from Version 7–10.xx to Version 11.0*.

Conventions

bold text	Indicates text that you need to enter, command names, and buttons in menu paths. Example: Enter **wfsm &**
	Example: Use the **dinfo** command.
	Example: ATM DXI > Interfaces > **PVCs** identifies the PVCs button in the window that appears when you select the Interfaces option from the ATM DXI menu.
italic text	Indicates variable values in command syntax descriptions, new terms, file and directory names, and book titles.
quotation marks (“ ”)	Indicate the title of a chapter or section within a book.
`screen text`	Indicates data that appears on the screen. Example: `Set Bay Networks Trap Monitor Filters`
separator (>)	Separates menu and option names in instructions and internal pin-to-pin wire connections. Example: Protocols > AppleTalk identifies the AppleTalk option in the Protocols menu.
	Example: Pin 7 > 19 > 20
vertical line (|)	Indicates that you enter only one of the parts of the command. The vertical line separates choices. Do not type the vertical line when entering the command. Example: If the command syntax is
	show at routes | **nets**, you enter either **show at routes** or **show at nets**, but not both.

Acronyms

CCP	Compression Control Protocol
CPC	continuous packet compression
CRC	cyclic redundancy check
DDN	Defense Data Network
IETF	Internet Engineering Task Force
ILI	Intelligent Link Interface
LCP	Link Control Protocol
MIB	management information base
NCP	Network Control Protocol
PDN	Public Data Network
PPC	packet-by-packet compression
PPP	Point-to-Point Protocol
PTOP	Point-to-Point Protocol (proprietary to Bay Networks)
PVC	permanent virtual circuit
RFC	Request for Comment
VC	virtual circuit
WAN	wide area network
WCP	WAN Compression Protocol

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Sydney, Australia	(612) 9927-8800	(612) 9927-8811
Tokyo, Japan	(81) 3-5402-0180	(81) 3-5402-0173

Chapter 1
Starting Compression

The quickest way to begin using data compression on your network is to enable it with the default values that Bay Networks software supplies. The procedures in this chapter describe how.

Preparing a Configuration File

Before you can start data compression, you must:

1. Create and save a configuration file that has at least one WAN interface.
2. Retrieve the configuration file in local, remote, or dynamic mode.
3. Specify router hardware if this is a local mode configuration file.

Configuring Software Compression

Software compression works on all router platforms and all serial interfaces. You can use software compression with Frame Relay, PPP, or X.25.

To configure software compression:

1. **Select the link or net module connector on which you are enabling data compression.**
2. **Specify Frame Relay, PPP, or X.25 as the WAN protocol.**

> **Site Manager Path:** From the Protocols window that appears after you select the link or net module, select PPP, Frame Relay, or X.25. Click on OK. The Select Protocols window appears.

For further information about these steps, refer to *Configuring Routers*.

Configuring Hardware Compression

To use hardware compression you must have an octal sync link module with a hardware compression daughterboard for the BN, or a hardware compression net module for the ASN. You can use hardware compression with Frame Relay and PPP.

Configuring Compression for the Backbone Node (BN)

To configure hardware compression for the BN®:

1. **Select either AG2104037 or AG2104038**.

   These are the octal sync link modules with hardware compression daughterboards.

2. **Select a port.**

3. **Specify Frame Relay or PPP as the WAN protocol.**

Site Manager Path: From the Protocols window that appears after you select the port, select PPP or Frame Relay. Click on OK. The Select Protocols window appears.

Configuring Compression for the Access Stack Node (ASN)

To configure hardware compression for the ASN™:

1. **Select either AG2104007 or AF2104012.**

   These are the hardware compression net modules for the ASN.

2. **Select a WAN connector on the same slot.**

3. **Select a port.**

4. **Specify Frame Relay or PPP as the WAN protocol.**

Site Manager Path: From the Protocols window that appears after you select the port, select PPP or Frame Relay. Click on OK. The Select Protocols window appears.

Note: If you have a hardware compression net module on an ASN, you can use hardware compression on any WAN port on that single router or slot. Hardware compression on the ASN does not work across slots; that is, it does not provide compression for any other ASNs in the stack.

Starting Data Compression

You enable data compression for PPP and Frame Relay differently from X.25.

Starting Data Compression for Frame Relay and PPP

Enable WCP. You can also enable other protocols that you want to configure.

Site Manager Path: In the Select Protocols window, scroll down to select WCP. Click on OK.

Starting Data Compression for X.25

You enable WCP only after you have added a service record. You can also enable other protocols at the same time.

Site Manager Path: After you have configured a service record, in the Service Record Window, select Protocols > Add/Delete. The Select Protocols window appears. Scroll down to select WCP. Click on OK.

You must also enable the X.25 service record compression parameter for each X.25 interface that you configure.

See *Configuring X.25 Services* for further information about X.25 service records.

Finding Further Information

For detailed information on Bay Networks data compression, refer to Chapter 2. For information and recommendations about using nondefault values, refer to Chapter 3.

Deleting Data Compression from a Platform

To delete WCP from *all* circuits on the router, complete the following steps.

Site Manager Path: Configuration Manager > Protocols > WCP > Delete WCP. A window appears and prompts: `Do you REALLY want to delete WCP`? Click on OK. Site Manager returns you to the Configuration Manager window. WCP is no longer operating on the platform.

Chapter 2
Data Compression Overview

Bay Networks data compression services enable you to reduce line costs and improve response times over wide area networks. Our data compression eliminates redundancies in data streams. When you use compression on your network, bandwidth efficiency improves, and you can transmit more data over a given amount of network bandwidth.

Our compression services include

- Software-based compression for Frame Relay, Point-to-Point Protocol (PPP), and X.25 networks for all router platforms and all serial interfaces. This includes PPP compression on multiline, multilink, on the ISDN BRI and PRI modules, and on interfaces that use raise DTR or V.25 bis signaling with dial services. It also includes Frame Relay compression on multiline and dial backup.
- Hardware-based compression for Frame Relay and PPP networks that use the octal synchronous link module for the BN using Fast Routing Engine-2 (FRE®-2) processors. Hardware compression supports all of the PPP and Frame Relay services that software compression supports.
- Hardware-based compression for Frame Relay and PPP networks for the ASN. A compression net module compresses data transmitted over a WAN network by dual and quad synchronous, MCE1/ISDN PRI, MCT1/ISDN, dual sync with ISDN BRI, and QBRI net modules. Hardware compression supports all of the PPP services that software compression supports.

Bay Networks software- and hardware-based compression interoperate fully because they use the same algorithm.

To use data compression effectively, you must decide how to allocate memory for this task. The goal is to compress data as much as possible and to transmit the data as quickly as possible without unduly taxing the resources of the router.

Data Compression Architecture

Bay Networks uses the following algorithm and protocols to provide data compression services:

- LZ-77 algorithm
- Compression Control Protocol (draft RFC)
- Bay Networks proprietary compression protocol (WCP)

LZ-77 Algorithm

We base our data compression on a Lempel-Ziv (LZ-77) algorithm. The algorithm uses a sliding history buffer that stores the data that the network link has processed most recently. The compressor compares new data strings with data it has already processed and stored in the buffer. When the compressor detects data strings that match data it has already processed, it replaces those strings with offset and length tokens that are shorter than the original strings, thus compressing the data.

Compression Control Protocol (CCP)

Bay Networks uses the draft RFC Compression Control Protocol (CCP) only to enable or disable compression for PPP. CCP also includes a history reset request and acknowledgment capability, but our implementation of data compression does not use these features.

Bay Networks Compression (WCP)

Bay Networks data compression uses WAN Compression Protocol (WCP), which is an IETF draft standard. WCP enables compression for Frame Relay and for X.25, and transports compressed packets for Frame Relay, X.25, and PPP. WCP negotiates compression mode, history size, and buffer size. For Frame Relay and PPP, WCP also retransmits packets in the event of packet loss, and protects against inadvertent data expansion (LAPB retransmits packets for X.25).

Data Compression Performance

The goals in using data compression are to achieve a high *compression ratio* while maximizing *throughput.* Compression ratio is the size of uncompressed data compared to the size of the same data after it has been compressed. Throughput refers to the speed of transmitting data.

The compression ratio varies according to the effectiveness of the compression algorithm, but also according to the characteristics of the data you are transmitting: data that includes a lot of redundant strings compresses at a high ratio.

Throughput, or network response time, varies with the number of elements in the network that the data must traverse, including the compression/decompression process.

Software Compression

Bay Networks software-based data compression is most effective for sites that have WAN connections at relatively low speeds such as 56/64 KB, where you want to achieve data compression at low cost, and with minimal memory requirements. It supports up to 512 Kb/s on the FRE-040. For networks operating at faster speeds, you should use hardware compression.

Hardware Compression

Bay Networks hardware-based compression works with Frame Relay and PPP networks. It best serves sites that support T-1/E-1 lines, which often concentrate many lower-speed remote connections. Our hardware compression facility operates at high speeds, and also supports high-density WAN connections. Use hardware compression when you want to achieve high compression ratios and throughput, and also want to preserve router memory to perform other functions.

We offer two compression daughterboards for the BN and two compression net modules for the ASN.

Hardware Compression for the BN

The compression daughterboards for the BN are

- AG2104037 - Octal Sync with a 32-contexts hardware compression daughterboard
- AG2104038 - Octal Sync with a 128-contexts hardware compression daughterboard

Hardware Compression for the ASN

The hardware compression net modules for the ASN can compress data transmitted over WAN networks attached to dual and quad synchronous, MCE1/ISDN PRI, MCT1/ISDN, dual sync with ISDN BRI, and QBRI net modules. One compression net module in a single ASN can provide hardware compression for all the net modules on that router. It does not provide compression for any other ASNs in the stack.

The compression net module is available in both a 32-contexts and a 128-contexts version.

The compression net modules for the ASN are

- AF2104007 - a 32-contexts hardware compression net module
- AF2104012 - a 128-contexts hardware compression net module

Hardware Compression Contexts

A *context* refers to compression and decompression for a single virtual circuit (VC). Compression hardware maps a context to specific regions of compression and decompression memory. If you have a 32-contexts compression daughterboard or net module, you can simultaneously run compression over 31 continuous packet compression (CPC) contexts, each using an 8 KB history size, with one shared 8 KB packet-by-packet (PPC) context. If you have a 128-contexts compression daughterboard or net module, you can simultaneously run compression over 127 CPC contexts, each using an 8 KB history size, with one shared 8 KB PPC context. For more information on CPC and PPC, see the “Compression Mode” section later in this chapter.

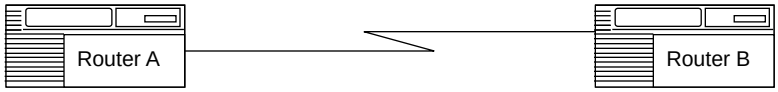
The only difference between the 32-contexts and 128-contexts Bay Networks compression daughterboards and net modules is that the 128-contexts daughterboard and net module have more memory: 2 MB compression/1 MB decompression, as opposed to 512 KB compression/256 KB decompression for the 32-contexts daughterboard and net module.

Note: You should plan your network to use hardware compression on the VCs most important to you within the limits of your equipment. If you configure more VCs for hardware compression than your daughterboard or net module can support, you have no way of controlling which VCs will in fact use hardware compression. By default, all VCs that exceed the hardware context limit use software compression.

For more information, see the “History Size” section later in this chapter.

How Data Compression Works

The following sections describe how Bay Networks data compression works. As you read these sections, refer to Figure 2-1, which illustrates CCP and WCP initialization on a PPP link.



1. PPP interface on network; LCP negotiations complete; begin CCP negotiations:

Send Initialization-Request →
← Send Initialization-Request
Send Initialization-ACK →
← Send Initialization-ACK

2. CCP negotiations complete; begin WCP negotiations, including compression mode, history size, and buffer size:

Send Initialization-Request →
← Send Initialization-Request
Send Initialization-ACK →
← Send Initialization-ACK

3. WCP negotiations complete; begin NCP negotiations:

Send Configure-Request →
← Send Configure-Request
Send Configure-ACK →
← Send Configure-ACK

4. NCP open; begin transmitting data:

← Send Data →

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Figure 2-1. CCP, WCP, and NCP Initialization on a PPP Link

CCP Negotiations

CCP allows the two ends of a PPP connection to negotiate whether to use data compression, and if so, which algorithm to use. Our implementation of compression uses only the LZ-77 algorithm.

Note: If one side of a link requests an algorithm that the other side does not support, traffic over the link continues, but in uncompressed form.

In the example shown in Figure 2-1, negotiations begin when PPP establishes a link. CCP uses the same configuration and network control protocol negotiations that the Link Control Protocol (LCP) uses. For a detailed explanation of LCP negotiations, see “Establishing the PPP Link” in *Configuring PPP Services.*

WCP Negotiations

Frame Relay and X.25 use WCP to negotiate whether to use data compression, and which algorithm to use. As with PPP, if one side of a link requests an algorithm that the other side does not support, traffic continues, but in uncompressed form.

Each side of a link running data compression has a compressor, a decompressor, a compression history, and a retransmission buffer. When you configure compression, you can edit WCP parameters for compression mode, history size, and buffer size to optimize compression performance on your network.

Data Transmission

Frame Relay and X.25 data transmission using compression begins when WCP negotiations are complete. For PPP, Network Control Protocol (NCP) negotiations and WCP negotiations occur simultaneously. When PPP, NCP, and WCP negotiations are complete, data transmission using compression begins.

Compression Features for Specific Protocols

Bay Networks data compression services vary in some details according to the WAN protocols that you configure. Read the following sections to learn about how our implementation of data compression applies to Frame Relay, PPP, and X.25 services.

Frame Relay Services

You can use software- or hardware-based data compression with Frame Relay. You can use compression with some VCs, and not with others, as you choose, both for regular Frame Relay VCs, and for those you configure in hybrid mode. You can also use compression with dial backup.

You must enable compression on both sides of a Frame Relay link. If you enable data compression on only one side of the link, data transmission occurs, but in uncompressed form.

Frame Relay Hybrid Access

Hybrid access enables you to combine bridging and routing over a single Frame Relay interface.

When you enable data compression for Frame Relay on a hybrid circuit, both the bridged and the routed traffic over that circuit are compressed. Note that compression applies only to the hybrid PVC, and not to the other PVCs from the main circuit, unless you have also enabled compression for those interfaces. Conversely, if you enable data compression for other PVCs, but not on a PVC you have configured for hybrid mode, the hybrid circuit does not use compression.

Frame Relay Dial Backup

Frame Relay enables you to configure a *dial backup* feature. If a primary Frame Relay circuit fails and you have enabled dial backup, the router automatically establishes a backup circuit. The backup circuit can be PPP or Frame Relay for a Frame Relay service record with only one PVC. The backup circuit is Frame Relay for a Frame Relay service record with two or more PVCs.

The backup circuit can inherit the primary's configuration, or it can use its own. When the Frame Relay primary and backup use the same configuration, they have a *shared* configuration. The backup circuit uses the same network-layer address as the primary circuit. The data-link layer configuration, that is, the backup PVCs, DLCIs, and filters can be the same or different from the primary.

If the backup uses a unique configuration, it is a *secondary* configuration. A secondary configuration uses a different network-layer address, PVCs, and filters from the primary.

To use data compression with dial backup for Frame Relay, you must configure compression on the backup circuit, because with either a shared or secondary configuration, the backup PVCs can use different configurations from the primary.

For further information on Bay Networks dial services, refer to *Configuring Dial Services*.

Frame Relay Multiline

Multiline is a feature that enables you to configure a single circuit that consists of one or more WAN data paths. A data path is a logical point-to-point channel; it can be a permanent or dial-up physical line, or it can be a virtual circuit connection. Multiline provides both increased fault tolerance and greater bandwidth between two sites.

For more information about Bay Networks multiline, refer to *Configuring Line Services*.

PPP Services

You can use software or hardware data compression on all PPP circuits, including multiline and multilink, bandwidth-on-demand, dial-on-demand, and dial backup lines. When you use compression on a bandwidth-on-demand, dial-on-demand, or dial backup circuit, WCP automatically configures or deletes compression as lines are added to or removed from the circuit.

PPP Multiline

Multiline is a feature that enables you to configure a single circuit that consists of one or more WAN data paths. A data path is a logical point-to-point channel; it can be a permanent or dial-up physical line, or it can be a virtual circuit connection. Multiline provides both increased fault tolerance and greater bandwidth between two sites.

For more information about Bay Networks multiline, see *Configuring Line Services*.

PPP Multilink

The *multilink* feature of PPP provides capabilities beyond those of multiline circuits. Multilink consists of a *bundle* of lines between two peers, consisting of up to four links. Multilink can

- Distribute traffic across the lines in the bundle in amounts roughly proportional to the effective bandwidth of each link.
- Use lines that have different speeds, proportionally distributing traffic over those lines.
- Balance traffic load and restore packet sequence.
- Use switched lines (such as ISDN-B channels) as well as leased lines.
- Monitor traffic volume.

PPP Bandwidth-on-Demand

Bandwidth-on-demand allows a secondary, dial-up line to augment a primary, leased line when the primary line experiences congestion. Congestion occurs when traffic volume exceeds line capacity. When congestion abates, the secondary line becomes inactive.

PPP Dial-on-Demand

Dial-on-demand enables you to establish a circuit only when you want to transmit and receive data, as opposed to having a leased line, which is always available. By using a circuit on a demand basis, you can significantly reduce your line costs.

PPP Dial Backup

PPP also allows you to configure a *dial backup* feature. If a primary PPP line fails and you have enabled dial backup, the router automatically establishes a backup line. You cannot enable any protocols, including compression, on a backup circuit, because a backup circuit inherits its protocols from the primary circuit. If the primary circuit uses compression, then the backup circuit does also.

For further information on Bay Networks dial services, refer to *Configuring Dial Services*.

X.25 Services

An X.25 network permits as many as 128 VCs to exist on the same physical link at the same time. You can configure each of those interfaces individually to use data compression or not.

X.25 PDN and DDN Services

When you use data compression on circuits that you configure for X.25 PDN or DDN services, you must be careful to enable compression on both sides of the link. If you configure compression on only one side of a PDN or DDN link, the data that travels over that link will be garbled.

You must also remember to enable the X.25 service record compression parameter for each X.25 interface that you configure. See *Configuring X.25 Services* for more information about this parameter.

Adjusting X.25 Max Window Size

Window size can affect packet throughput across the X.25 network. Setting the X.25 Max Window Size parameter too low can cause the router to drop packets and render data compression ineffective. You should configure this parameter at a higher value than the default setting.

Summary of Bay Networks Data Compression Features

You can configure both software- and hardware-based compression

- On a circuit or line basis
- With multiline and multilink

Features specific to software and hardware compression follow.

Software-Based Data Compression

Software-based data compression works over WAN links running Frame Relay, PPP, or X.25. It includes

- Compression for a FRE module at 4 x 128 KB/s compressed throughput, full duplex; or 512 KB/s aggregate compressed throughput
- Compression on an Access Node (AN®) platform at 2 x 64 KB/s compressed throughput, full duplex; or 128 KB/s aggregate compressed throughput
- Compression on all intelligent link interface modules (ILIs) that support serial and ISDN BRI ports
- Support for all Bay Networks platforms: AN, ASN, and BN, plus VME
- Compression on MCT-1 and MCE-1 lines

Hardware-Based Data Compression

Hardware compression works over WAN links running Frame Relay and PPP. Hardware compression is available as

- Optional daughterboards for Frame Relay and PPP networks that use the octal synchronous link module for the BN, using FRE-2 processors only.
- Optional net modules for Frame Relay and PPP networks that use the ASN. Hardware compression can compress data transmitted over WANs attached to dual and quad synchronous, MCE1/ISDN PRI, MCT1/ISDN, dual sync with ISDN BRI, and QBRI net modules.

Chapter 3
Customizing Data Compression

When you enable data compression, default values are in effect for all parameters (see parameter descriptions in Appendix A). You may want to change these values, depending on the requirements of your network. The following sections provide information about Bay Networks compression and decisions you make to use compression effectively on your network.

Allocating Compression Memory

Using compression on your network involves allocating memory to maximize compression without unduly taxing the resources of your system. You can select

- A compression mode, to maximize compression ratio
- A history size, to maximize throughput
- A buffer size, to prevent data loss

Maximizing Compression Ratio

You can compress data in one of two modes:

- Continuous Packet Compression (CPC) maintains compression history across packets. CPC yields a higher compression ratio than does Packet-by-Packet. In most circumstances, you should select CPC, the default value, to maximize compression.
- Packet-by-Packet Compression (PPC) creates a new history for each packet. PPC yields a lower compression ratio than does CPC. Select PPC only for links that drop a very large number of packets. Be aware that under these circumstances, implementing data compression may offer marginal or no advantages.

If either side of the link specifies PPC, both sides of the link use PPC.

Site Manager: Compression Mode parameter: page A-2 (line); page A-6 (circuit interface)

Maximizing Throughput

Each side of the link has both a *compression* and *decompression history* and a *lookup table*. The compression and decompression histories maintain a record of data that has already traveled across the network. The lookup tables maintain pointers to redundant strings and the offset and length tokens that replace each of those strings.

You can specify either 8 KB or 32 KB of local memory to maintain a compression history.

If the link uses software compression with a history of 8 KB, each end of the link allocates 8 KB of memory for compression, 16 KB for the compression lookup table, and 8 KB for decompression, or 32 KB. If the link uses a compression history of 32 KB, each end of the link allocates 32 KB of memory for compression, 64 KB for the compression lookup table, and 32 KB for decompression, for a total of 128 KB. Hardware compression entails similar requirements.

If you select different values for history size for the two sides of the link, 8 KB becomes the history size for both sides of the link.

8 KB History Size

In general, 8 KB histories are appropriate for Frame Relay and X.25, when you have large numbers of VCs and need to be conservative when you allocate memory to each of them.

32 KB History Size

For PPP, with only one circuit per line, you may want to use a 32 KB history.

You may want to allocate a 32 KB history size for links with speeds higher than 64 Kb/s to improve throughput. The compressor can find a data pattern match up to three times faster using a 32 KB history than an 8 KB history.

History Size with Hardware Compression

Hardware compression daughterboards and net modules are available in 32 and 128 contexts. The numbers 32 and 128 assume a history size of 8 KB per context, although you can configure history size at either 8 KB or 32 KB. For example, if you configure history size at 32 KB, you have used four 8 KB contexts, and you have that many fewer contexts available to run hardware compression on your network.

Note: Although software compression does not put strict limits on the number of contexts you can configure, be aware that memory requirements for history size are the same for software and hardware compression.

Both boards reserve one 8 KB context for PPC, as opposed to CPC. There is no limit to the number of VCs that can use this one PPC context. The maximum number of VCs for the compression engine is 256.

The compression hardware uses memory in units called *pages*, where a page equals 32 KB of memory. Each context that uses a 32 KB history uses one page of memory. Restrictions for CPC contexts using either 8 or 32 KB histories are that the memory used for any one history must be continuous, and it may not cross pages. For 8 KB contexts, these restrictions create few constraints, but for 32 KB contexts, they are significant.

Thirty-one CPC contexts each using an 8 KB history are possible on the 32 context board, and 127 contexts each using an 8 KB history are possible on the 128 context board. Table 3-1 indicates the maximum number of 8 KB contexts each board can support.

Table 3-1. Hardware Compression -- 8 KB Contexts

	Max 8 KB CPC Contexts	Available 32 KB CPC Contexts	Reserved 8 KB PPC Context
32 Context Board	31	0	1
128 Context Board	127	0	1

On a 32 context board, the maximum number of 32 KB contexts is 7, and on a 128 context board, the maximum number of 32 KB contexts is 31, because of the 8 KB of memory the one PPC context requires. Table 3-2 summarizes this information.

Table 3-2. Hardware Compression -- 32 KB Contexts

	Max 32 KB CPC Contexts	Available 8 KB CPC Contexts	Reserved 8 KB PPC Context
32 Context Board	7	3	1
128 Context Board	31	3	1

You can mix 8 KB and 32 KB contexts on either board. Be aware that if you are bringing VCs up and down, memory may fragment. Even though you have 32 or more KB of compression memory available, if it is on different pages you will not be able to configure a 32 KB context. To solve this problem, you must save your configuration and reset the slot. When you reset the slot, available compression memory is rearranged to be contiguous.

If you have memory available, you are always able to add an 8 KB context, because 8 KB is the smallest divisible amount of compression memory.

Site Manager: History Size parameter: page A-3 (line); page A-7 (circuit interface)

Preventing Data Loss for Frame Relay and PPP

Buffer size is the amount of memory allocated to keep the transmission history. You must configure this parameter to protect against data loss if you run Frame Relay or PPP. You can use a buffer size of None, Normal, Large, or Very Large. The default value is Normal. Configure buffer space based on the following conditions:

- Length of time it takes for data to travel over the link.

  A Normal buffer size usually suffices for a coast-to-coast connection within the United States. You may need a Large or Very Large buffer if your link is over a satellite connection.

- Number of dropped packets.

  Increase the buffer size on a link with a large number of dropped packets. Decrease the buffer size, even to None, to conserve memory on a link with a very small number of dropped packets.

- Number of resets.

  Increase the buffer size for a link with a large number of resets and a low number of dropped packets. Be aware, however, that a high number of resets may occur for reasons unrelated to buffer size.

Note: X.25 is a reliable protocol, which means that it has features that check for errors and prevent data loss. Bay Networks data compression software therefore ignores the Buffer Size parameter for X.25, so if you are configuring compression for X.25, you do not need to set this parameter.

Site Manager: Buffer Size parameter: page A-4 (line)

Configuring Hardware Compression

There are two issues specific to hardware compression.

Selecting Software or Hardware Compression Engines

When you configure a VC for compression, the default compression type varies. The default is software compression for link modules that do not support hardware compression; for those that do, the default is hardware (refer to "Hardware Compression" in Chapter 2). The default for a net module is software compression, unless the ASN has a hardware compression net module. If an ASN has a hardware compression net module, the default is hardware.

You can use software compression even though you are using a hardware compression daughterboard or net module. Bay Networks recommends that you use hardware compression for connections greater than 512 Kb/s. You would also want to specify software compression for VCs in excess of the number of contexts your hardware compression daughterboard or net module can support.

Configure a VC to use software compression by setting the Engine Type parameter to software.

Site Manager: Engine Type parameter: page A-4 (line); page A-8 (circuit interface)

Selecting a Fallback Compression Mode

Fallback compression mode is configurable on a line basis only. Use it to indicate the compression mode that you want to use when no hardware compression contexts are available. The options are Software CPC and Hardware PPC.

Software CPC is a good choice for lower speed links, 64 Kb/s or less. It generally affords a better compression ratio than does Hardware PPC.

Hardware PPC is a good choice for higher speed links, greater than 64 Kb/s. It provides better throughput than does Software CPC.

Site Manager: Fallback Compression Mode parameter: page A-5

Appendix A
Data Compression Parameters

WCP Line Parameters

Use the following descriptions to set Bay Networks data compression line parameters. Notice that the Site Manager path for all line parameters is the same, as is the path for all circuit interface parameters. This means that you can edit all line parameters or all interface parameters at the same time.

Parameter: Enable

Path:	Configuration Manager > Protocols > WCP > Lines
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables data compression on the line
Instructions:	WCP automatically sets this parameter to Enable when you select WCP in the Select Protocols window. If you want to temporarily disable WCP rather than delete it from the platform, set this parameter to Disable. Reset it to Enable to reenable WCP.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.1.1.2

Parameter:	**Compression Mode**
Path:	Configuration Manager > Protocols > WCP > Lines
Default:	Continuous Packet
Options:	Continuous Packet | Packet by Packet
Function:	Continuous Packet Compression (CPC) retains compression history across packets and allows a higher compression ratio than does Packet-by-Packet Compression (PPC). PPC resets compression history at the start of each packet, resulting in a lower compression ratio. Since PPC does not depend on previous packets, you should select this option for a link that drops a large number of packets.
Instructions:	Select either Continuous Packet or Packet by Packet.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.1.1.5

Parameter: **History Size**

Path: Configuration Manager > Protocols > WCP > Lines

Default: 32 K

Options: 32 K | 8 K

Function: Indicates the amount of memory allocated to compression history for the line.

Remember that history size entails separate compression and decompression histories and lookup tables on each side of a link. For example, if the link uses software compression with a history of 8 KB, each end of the link allocates 8 KB of memory for compression, 16 KB for a compression lookup table, and 8 KB for decompression, or 32 KB total. If the link uses a compression history of 32 KB, each end of the link allocates 32 KB of memory for compression, 64 KB for a compression lookup table, and 32 KB for decompression, for a total of 128 KB. Hardware compression entails similar requirements.

Selecting 32 K for PPP WCP should not pose a problem for the BN, because PPP allows only one circuit per line. Select 8 K or 32 K for Frame Relay and X.25 lines, depending on the resources of your network.

Selecting 32 K for PPP WCP on the ASN can cause problems, particularly if you are using a 32-context compression net module.

In general, 8 KB histories are appropriate for WAN links that run at 64 Kb/s or less, because less throughput is required. Use an 8 KB history size with Frame Relay and X.25, which have large numbers of VCs and low available bandwidth, and with PPP on a 32-context net module.

You may want to allocate a 32 KB history size for links with speeds higher than 64 Kb/s to improve throughput. The compression engine can find a data pattern match up to three times faster using a 32 KB history than an 8 KB history.

If you select different history sizes for the two sides of a link, the smaller of the two becomes the effective history size.

Instructions: Select either 32 K or 8 K.

MIB Object ID: 1.3.6.1.4.1.18.3.4.22.1.1.6

Parameter: **Buffer Size**

Path: Configuration Manager > Protocols > WCP > Lines

Default: Normal

Options: Very Large │ Large │ Normal │ None

Function: Indicates the amount of buffer memory for the transmission history on a line. Set this parameter according to the end-to-end round-trip length of a WCP connection.

Instructions: Select Normal for most land-line, coast-to-coast connections.

Select Large or Very Large for connections at a great distance from each other, such as satellite connections.

Select None for links that drop a very small number of packets.

Increase the buffer size for a link with a large number of resets.

MIB Object ID: 1.3.6.1.4.1.18.3.4.22.1.1.7

Note: Because X.25 has features that check for errors and prevent data loss, Bay Networks data compression software ignores the Buffer Size parameter for X.25. If you are configuring compression for X.25, you do not have to set this parameter.

Parameter: **Engine Type**

Path: Configuration Manager > Protocols > WCP > Lines

Default: Software, unless you have configured either an Octal Sync Link module that has a hardware compression daughterboard for the BN, or a hardware compression net module for the ASN, in which case the default is Hardware.

Options: Software │ Hardware

Function: Determines whether compression for this node will be software- or hardware-based. You can use hardware compression with Frame Relay and PPP only. You can use software compression with Frame Relay, PPP, or X.25.

Instructions: Select Software to use software-based compression or select Hardware to use hardware-based compression.

MIB Object ID: 1.3.6.1.4.1.18.3.4.22.1.1.8

Parameter: **Fallback Compression Mode**

Path: Configuration Manager > Protocols > WCP > Lines

Default: Software CPC

Options: Software CPC | Hardware PPC

Function: This parameter is for hardware compression only. Use it to indicate the compression mode you want to use when no hardware compression contexts are available.

Software CPC is a good choice for lower speed links, 64 Kb/s or less. It generally affords a better compression ratio than does Hardware PPC.

Hardware PPC is a good choice for higher speed links, greater than 64 Kb/s. It provides better throughput than does Software CPC.

Refer to Chapter 1 for explanations of continuous packet and packet-by-packet compression modes.

Instructions: Select Software CPC or Hardware PPC.

MIB Object ID: 1.3.6.1.4.1.18.3.4.22.1.1.10

WCP Circuit Interface Parameters

Use the following descriptions to set Bay Networks data compression.

Parameter: **Enable**

Path: Configuration Manager > Protocols > WCP > Interfaces

Default: Enable

Options: Enable | Disable

Function: Enables or disables data compression on the line

Instructions: WCP automatically sets this parameter to Enable when you select WCP in the Select Protocols window. If you want to temporarily disable WCP rather than delete it from the platform, set this parameter to Disable. Reset it to Enable to reenable WCP.

MIB Object ID: 1.3.6.1.4.1.18.3.4.22.2.1.2

Parameter:	**Compression Mode**
Path:	Configuration Manager > Protocols > WCP > Interfaces
Default:	Inherit from Line
Options:	Continuous Packet | Packet by Packet | Inherit from Line
Function:	Indicates the compression mode on the circuit. Continuous Packet Compression (CPC) retains compression history across packets and allows a higher compression ratio than does Packet-by-Packet Compression (PPC). PPC resets compression history at the start of each packet, resulting in a lower compression ratio. Since PPC does not depend on previous packets, you should select this option for a link that drops a large number of packets. Inherit from Line allows you to set WCP parameters at the line level and apply them to circuits. For PPP, with only one circuit per line, this means that you can configure WCP at either the circuit level or the line level.
Instructions:	Select Inherit from Line if you want to accept the value in effect for the WCP Compression Mode line parameter. Otherwise, select either Continuous Packet or Packet by Packet.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.2.1.4

Parameter: **History Size**

Path: Configuration Manager > Protocols > WCP > Interfaces

Default: Inherit from Line

Options: 32 K │ 8 K │ Inherit from Line

Function: Indicates the amount of memory allocated to compression history for the circuit.

Remember that history size entails separate compression and decompression histories and lookup tables on each side of a link. For example, if the link uses software compression with a history of 8 KB, each end of the link allocates 8 KB of memory for compression, 16 KB for a compression lookup table, and 8 KB for decompression, or 32 KB total. If the link uses a compression history of 32 KB, each end of the link allocates 32 KB of memory for compression, 64 KB for a compression lookup table, and 32 KB for decompression, for a total of 128 KB. Hardware compression entails similar requirements.

Selecting 32 K for PPP WCP should not pose a problem for the BN, because PPP allows only one circuit per line. Select 8 K or 32 K for Frame Relay and X.25 lines, depending on the resources of your network.

Selecting 32 K for PPP WCP on the ASN can cause problems, particularly if you are using a 32-context compression net module.

In general, 8 KB histories are appropriate for WAN links that run at 64 Kb/s or less, because less throughput is required. Use an 8 KB history size with Frame Relay and X.25, which have large numbers of VCs and low available bandwidth, and with PPP on a 32-context net module.

You may want to allocate a 32 KB history size for links with speeds higher than 64 Kb/s to improve throughput. The compression engine can find a data pattern match up to three times faster using a 32 KB history than an 8 KB history.

If you select different history sizes for the two sides of a link, the smaller of the two becomes the effective history size.

Inherit from Line allows you to set WCP parameters at the line level and apply them to circuits.

Instructions: Select Inherit from Line if you want to accept the value in effect for the WCP History Size line parameter. Otherwise, select either 32 K or 8 K.

MIB Object ID: 1.3.6.1.4.1.18.3.4.22.2.1.5

Parameter:	**Engine Type**
Path:	Configuration Manager > Protocols > WCP > Interfaces
Default:	Inherit from Line
Options:	Software | Hardware | Inherit from Line
Function:	Determines whether compression for this node will be software- or hardware-based. You can use hardware compression with Frame Relay and PPP only. You can use software compression with Frame Relay, PPP, or X.25.
Instructions:	Select Inherit from Line if you want to accept the value in effect for the WCP Engine Type line parameter. Otherwise, select Software to use software-based compression or select Hardware to use Hardware-based compression.
MIB Object ID:	1.3.6.1.4.1.18.3.4.22.2.1.6

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